

Division of Family Medicine and Primary Care

Master of Philosophy in Family Medicine

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**Project title: How to improve the quality of care for women
with postpartum haemorrhage at Onandjokwe Hospital,
Namibia**



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Declaration

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Abstract

Background

Although no studies on the quality of emergency obstetric care including care for postpartum haemorrhage have been published from Namibia, the condition is a major cause of maternal morbidity and mortality and the huge burden of pregnancy related death is disproportionately shared by low and middle income countries in Africa and Asia.

Aim

The aim of this project was to assess and improve the quality of care for women with postpartum haemorrhage

Setting

Onandjokwe Hospital (maternity ward), Namibia

Methods

Quality improvement cycle

Results

One hundred and fifty two files were audited (eighty two in the baseline audit and seventy in the re-audit). In the baseline audit twelve out of nineteen structural target standards were achieved and none of the process target standard were met. During the re-audit ten months later, statistically-significant improvement in performance ($p < 0.05$) was observed, all structural target standard were achieved, six out of nine process target standard and two out three outcome target standard were met.

Conclusion

The quality of care for postpartum haemorrhage was substandard in our healthcare setting. Interventions were setup and implemented to improve the quality of care for postpartum haemorrhage. These interventions induced a significant improvement in structural and process criteria and a significant improvement was also seen in 91.4 % of women treated and stabilised from postpartum haemorrhage complications within six hours after being diagnosed during re-audit

Introduction

Postpartum haemorrhage (PPH) is the leading direct cause of maternal morbidity and mortality worldwide.^{1,2} The condition is contributing to 19.7% of maternal mortality globally and affects 2% of all women who give birth.^{3,4,5}

The Maternal Mortality Ratio (MMR) is an important indicator of the maternal health status within a given population.⁶ The MMR in many African countries, including Namibia (510 per 100,000 live births), is very high and obstetric haemorrhage accounts for more than one quarter of these maternal deaths.^{7,8} In 2000 the United Nations set up the Millennium Development Goals, with one of the goals to reduce the maternal mortality by three-quarters by 2015. In this regard the World Health Organization (WHO) indicated that this objective could be achieved by reducing deaths from PPH by 75%.^{8,9} Many Sub-Saharan countries unfortunately failed to achieve this objective by the end of 2015, and the annual number of maternal deaths remain very high despite the engagement and commitment of different countries and international stakeholders to improve access to quality health services for women and children.⁸ In 2013 about 289,000 women still died in pregnancy and child birth related events worldwide (with more than one life lost every 2 minutes). In this regard the United Nations has updated and launched the global strategy (2016-2030) for women's, children's and adolescents' health to complete the unfinished work of the Millennium Development Goals. The strategy aims to address inequities within and between countries and to help countries begin implementing the 2030 Agenda for Sustainable Development Goals (SDGs) in which one of the specific objective is to reduce the global MMR to less than 70 per 100,000 live births.¹⁰

Maternal deaths due to PPH have increased in many countries.^{1,11,12} And some factors such as the increasing maternal age at birth, the rising of caesarean section rate and the increasing multiple pregnancy rate as result of artificial reproductive techniques have been identified as strong contributors to the rise of maternal deaths related to obstetric haemorrhage.^{11,13,14,15} The low and middle income countries are the most affected by this condition and women in these countries have an increase likelihood of severe haemorrhage and of dying from PPH-related consequences.¹⁶

In Namibia, the MMR initially increased from 449 maternal deaths per 100,000 live births in 2008 to 604 maternal deaths per 100,000 live births in 2011.¹⁷ However, the Namibia Demographic and Health Survey (NDHS) of 2013 reported a MMR of 385 deaths per 100,000 live births, which is still very high. This means that for every 1,000 live births in Namibia during the 10 years preceding the 2013 NDHS, about four women died during pregnancy, childbirth, or within two months of childbirth.¹⁸

According to the WHO, PPH is defined as a blood loss greater than or equal to 500ml within 24 hours after birth, while massive PPH is a blood loss greater than 1000ml within 24 hours after birth. Bleeding within 24 hours after birth is considered to be primary PPH, while secondary

PPH is observed from 24 hours up to 12 weeks after birth.⁹ It is important to establish the main causes of primary PPH: atonic uterus which can be idiopathic or the result of retained products of conception, trauma to the birth canal as well as rare causes such as uterine inversion or clotting defects. Secondary PPH can be a result of infection due to retained products of conception, coagulopathy, trophoblastic disease or scar dehiscence due to infection.¹⁹

When dealing with PPH it is always advisable to identify its related risk factors, although none are found in one-third of cases.²⁰ The antenatal risk factors for PPH are: history of antepartum haemorrhage, low-lying placenta, previous PPH, history of retained placenta, multiparity, maternal low haemoglobin $\leq 8.5\text{g/dl}$, over distension of uterus by multiple pregnancies or polyhydramnios, and maternal age more than 35 years. The intrapartum risk factors for PPH are: induction of labour, labour augmentation by using oxytocin, prolonged labour or when labour has progressed faster than expected, instrumental delivery and caesarean section. Sometimes however PPH may be observed in a woman without risk factors and the bleeding may even be concealed, which is why every woman needs to be considered at risk. In many cases more than 70% of maternal deaths due to obstetric haemorrhage are considered to be preventable and are due to substandard care.^{11, 15, 20}

PPH can be prevented by the active management of the third stage of labour which is a sequence of actions to accelerate the delivery of placenta and prevent PPH. It includes the use of uterotonic medication, with oxytocin as the drug of choice that should be given within one minute of delivery. This is followed by controlled cord traction that helps the placenta to separate from the uterus and descend into the vagina. Delayed cord clamping for 2 to 3 minutes after the birth allows blood transfer from the placenta to the baby and helps to prevent anaemia in the new-born. These interventions when implemented can reduce the estimated maternal blood loss after birth by up to 66% when compared with physiological or expectant management.²¹ PPH care consists of two important aspects, on the one hand routine care with the goal of prevention and on the other hand emergency care for active bleeding.⁷ This requires teamwork, increased awareness of the problem, and anticipatory clinical practice to prevent PPH or respond quickly and use of evidence based PPH guidelines.²² Obstetric haemorrhage may also compromise directly the foetal wellbeing for instance when maternal haemorrhage is massive and the chance of the baby dying of birth asphyxia is high.^{23,24,25,26}

To reduce the huge burden of PPH on maternal and child health there is a necessity to provide high quality care to women with this lethal condition. Quality care requires both facility readiness and provider preparedness for dealing with PPH. In India deficiencies have been demonstrated in both facility readiness (availability of staff, key equipment, drugs supplies) as well as provider preparedness (knowledge and skills).²³

Improving healthcare providers' knowledge and skills in emergency obstetric care and ensuring that the healthcare facility has essential lifesaving resources have been identified as important factors that can impact on the high maternal mortality rate in many African countries.²⁴ Though

the maternal healthcare systems must be strengthened with attention to the knowledge and skills of healthcare workers, this requires increased clinical awareness, a rapid effective response to obstetric haemorrhage and shock, and overall health system strengthening.¹¹ Significant event analysis of maternal deaths and near-misses can also identify practical measures for tackling care deficiencies and interventions to improve maternal care quality.^{25,26, 27,28} It also means that to reduce deaths due to obstetric haemorrhage, the focus should be on reducing the time it takes for the woman who develops a complication to receive skilled care in an adequately resourced healthcare facility.²⁶ No studies on the quality of emergency obstetric care, including care for PPH, have been published from Namibia

Aim and objectives

The aim of this study was to assess and improve the quality of care for women with PPH at Onandjokwe Hospital, Namibia. The specific objectives were to assess the current quality of care for PPH; to plan and implement changes to improve the quality of care; and to assess if these changes were associated with a measurable improvement in the quality of care.

Methods

Study design

The study design was a quality improvement cycle (QIC). Six steps were followed in this process: The establishment of the QIC team, setting up of criteria and target standards, data collection, data analysis, planning and implementation of changes, repeat data collection and data analysis to detect changes in the quality of care.²⁹

Setting

The study was conducted at Onandjokwe Hospital, located in northern Namibia about 750 km from the capital city of Windhoek in Namibia. The hospital has been providing health services to the population since 1908, and since July 2015 it has been upgraded to be an Intermediate Hospital for the Oshikoto region by the Ministry of Health and Social Services. It provides comprehensive emergency obstetric care. Onandjokwe district covers approximately 25,000 km² with a catchment population of 147,000, mostly from the Wambo ethnic group. It is also serving as the primary hospital for villages in the immediate surroundings and as the nearest referral hospital for the district hospitals in the Oshana and Ohangwena regions.

The hospital has five departments (Paediatrics, Internal Medicine, Surgery, Obstetrics and Gynaecology and Anaesthesia) and each department is headed by a specialist. This study was conducted in the maternity wards of the Department of Obstetrics and Gynaecology. The Department has a consultant obstetrician-gynaecologist, four medical practitioners, two senior registered nurses, twenty six registered nurses, 6 midwives and sixteen enrolled nurses. The nursing staff work in three shifts (morning shift, afternoon shift and night shift).

The maternity services have 75 beds (antenatal care 11 beds, labour ward seven beds, delivery ward four beds and postnatal ward 53 beds). The hospital has a functioning theatre unit with two operating rooms shared by both the surgery and obstetrics-gynaecology departments and a functioning laboratory known as the Namibia Institute of Pathology (NIP).

Study population

The study for the initial audit included all women who delivered at Onandjokwe hospital and were documented with the diagnosis of primary PPH from the 1st January to 31st December 2015. The exclusion criteria were defined as women who had a home delivery and were admitted with the diagnosis of PPH; women diagnosed with PPH but referred from neighbouring regions and women diagnosed with secondary PPH after being discharged from the hospital.

The follow up audit included all women who delivered at Onandjokwe and were diagnosed with primary PPH from the 1st November 2016 to 31st August 2017. The exclusion criteria were the same as for the initial audit.

Sample size

For the initial audit 82 files of patients diagnosed with PPH in 2015 were audited and the follow up audit was done on 70 files.

Audit team

The audit team was headed by the main researcher and included two doctors and three nurses identified as key members of the maternity services, who agreed voluntarily to participate in the quality improvement cycle.

Target standards

The audit team used the guideline for maternity care from South Africa and the guideline for management of PPH from South Africa to set up evidence-based criteria.^{30, 31} The team agreed on measurable structural, process and outcome criteria, and set performance levels for each criterion to be achievable.

Structural target standards

A score was used for each item: if the item existed and was functioning well=2, if the item existed but was not fully functional=1, if the item did not exist=0. Target standards for structure were:

- 75% of medical officers in maternity ward are trained in obstetrics emergencies and neonatal resuscitation

- 50% of nurses in maternity ward are trained in obstetric emergencies and neonatal resuscitation
- The labour ward has a piped water supply
- There is a soap for hand wash in labour ward
- The labour ward has functioning electricity
- 75% of blood pressure machines in labour ward are functioning
- There is a functioning haemoglobin meter
- There is a guideline for maternity care in the labour ward
- There is a guideline on management of PPH
- There is standard protocol (what to do) for the management of the atonic uterus
- There is standard protocol (what to do) for the manual removal of placenta
- There are standard blood requisition forms
- There are informed consent forms for blood transfusion
- There are cross match tubes for the collection of blood samples
- There are intravenous fluids (crystalloids and colloids)
- There are plastic bags for the collection of blood samples
- There are oxygen cylinders with regulators
- There are uterotonic medication (oxytocin, misoprostol)
- There are antibiotics (β lactam, cephalosporin)

Process target standards

The target standards for the process were the following:

- 80% of women are diagnosed with PPH within 45 minutes after delivery
- 90% of women with uterine atony have been administered oxytocin within 5 minutes of diagnosis
- 90% of women received crystalloid fluids within 5 minutes of diagnosis of PPH
- 70% of women with uterine atony received uterine massage and bimanual compression if the uterus failed to contract despite oxytocin
- 50% of women with uterine atony received misoprostol within 25 minutes of determining failure of oxytocin
- 90% of women received prophylactic antibiotics after manual removal of placenta or uterine exploration
- 100% of women with low haemoglobin ($\leq 6\text{g/dl}$) received blood products
- 70% of women received blood products within 15 minutes after being diagnosed with a massive PPH
- 75% of women with a massive PPH were managed surgically (hysterectomy) within 60 minutes of diagnosis or within 120 minutes after delivery

Outcome target standards

The target standards for the outcome were:

- 90% of women were treated and stabilized within 6 hours of PPH
- 70% of women were given a follow up visit within 1 month after being discharged from the hospital
- 100% of women did not die from complication of PPH

Data collection

For the initial audit, patients with PPH were identified from the register and further information was collected from the patient's medical records in both the labour and postnatal wards from the 1st January to 31st December 2015.

The register books helped to retrieve the name and file number of women diagnosed with PPH during the audited period. Data was then collected from these records using a standardised collection tool.

The structural criteria were evaluated by inspection of the maternity services for the different items and a questionnaire was used to evaluate the proportion of healthcare workers that were trained in obstetric and neonatal emergency care. Data were collected by the main researcher.

Data analysis

The data was captured in a Microsoft Excel spreadsheet and checked for omissions and errors. Numerical coding was used when entering categorical data in Excel, for instance, "yes"=1 and no=0. Frequency distribution tables showing the number and percentages for each category were computed and bar/pie charts were constructed for all categorical variables. Numerical variables were summarized using mean and standard deviations or median and ranges depending on whether data were assumed symmetrically distributed or skewed. The results were compared to the target standards to determine how many targets were achieved at baseline. A knowledgeable statistician was consulted during the statistical analysis process.

Planning and implementation of change

The results of performance were presented to the audit team. The main researcher facilitated reflection by using the "5 Why" techniques as a way to identify root causes of the discrepancy between practice and the desired standard during the baseline audit then after the team had reached the consensus²⁹, the baseline audit findings were presented to the Obstetrics and Gynaecology Department, for further constructive feedback.

Following this the audit team made concrete plans to implement changes to clinical practice over a period of 10 months.

Repeat data collection and data analysis

After 10 months the team recollected data to measure the criteria (retrospectively on the 10 months of the intervention). Data were again analysed descriptively to see if there was improvement in the number of target standards achieved. In addition a Chi-square test was used to assess if there was a change in each criteria ($p < 0.05$).

Ethical considerations

The ethical approval for the study was obtained from Stellenbosch University's Health Research Ethics Committee (Reference S16/06/108) and from the Research Committee at Onandjokwe Hospital.

Results

There were 152 files audited, 82 at the baseline audit and 70 at the re-audit. Table 1 presents a profile of the women included in the two audits. The participants' mean age for both audits was 29.3 years. The two groups differed significantly in terms of their parity and marital status, with the re-audit group having more multiparous and married women, however the causes of PPH were similar between the two groups.

Table 1: Profile of mothers at baseline audit and re-audit

Variable	Baseline N= 82 n (%)	Re-audit N= 70 n (%)	p value
Parity			
Primiparous	34(41.5)	18(25.7)	0.041
Multiparous	48(58.5)	52(74.3)	
Marital status			
Single	62(75.6)	36(51.4)	0.002
Married	20(24.4)	34(48.6)	
Cause of postpartum haemorrhage			
Tears	17(20.7)	12(17.1)	0.317
Retained products of conception	13(15.9)	18(25.7)	
Atony	52(63.4)	40(57.1)	

Structural target standards

The performance levels for structural criteria during the baseline and re-audit are compared in Table 2. At baseline 12/19 (63%) of target standards were achieved, while 19/19(100%) were

achieved at re-audit. The number of medical officers and nurses trained in obstetric emergencies and neonatal resuscitation increased from 2/4 (50.0%) and 1/46 (2.2%) respectively to 3/4 (75.0%) and 27/50 (54.0%), while the number of functioning blood pressure machines increased from 1 (25.0%) to four (100.0%) out of four.

Table 2: Results for structural target standards

Structural target standards	Standard achieved	
	Baseline	Re-audit
75% of medical officers in maternity ward are trained in obstetric emergencies and neonatal resuscitation	No	Yes
50% nurses in maternity ward are trained in obstetric emergencies and neonatal resuscitation	No	Yes
The labour ward has a piped water supply	Yes	Yes
There is a soap for hand washing in labour ward	Yes	Yes
The labour ward has functioning electricity	Yes	Yes
75% of blood pressure machines in labour ward are functioning	No	Yes
There is a functioning haemoglobinmeter	Yes	Yes
There is a guideline for maternity care in labour ward	No	Yes
There is a guideline on management of PPH	No	Yes
There is standard protocol for the management of the atonic uterus	No	Yes
There is standard protocol for the manual removal of placenta	No	Yes
There are standard blood requisition forms	Yes	Yes
There are informed consent forms for blood transfusion	Yes	Yes
There are cross match tubes for the collection of blood sample	Yes	Yes
There are intravenous fluids(crystalloids and colloids)	Yes	Yes
There are plastic bags for the collection of cross match sample and blood requisition forms	Yes	Yes

There is an oxygen cylinder with regulator	Yes	Yes
There are uterotonic medications (oxytocin, misoprostol)	Yes	Yes
There are antibiotics (β lactam, cephalosporins)	Yes	Yes

Process target standards

The performance levels for process criteria at baseline and re-audit are compared in Table 3. None of the standards were achieved during baseline, but six out of nine were achieved during re-audit and seven of the nine criteria significantly improved.

Table 3: Results for process target standards

Process target standards	Baseline n (%)	Re-audit n (%)	p value
80% of women diagnosed with PPH within 45 minutes after delivery	30/82 (36.6)	55/70 (78.6)	< 0.001
90% of women with uterine atony have been administered oxytocin within 5 minutes of diagnosis	29/53 (54.7)	33/42 (78.6)	0.015
90% of women received intravenous crystalloid fluid within 5 minutes of diagnosis of PPH	38/82 (46.3)	65/70 (92.9)	< 0.001
70% of women with uterine atony received uterine massage and bimanual compression if the uterus failed to contract despite oxytocin	21/52 (40.3)	30/40 (75.0)	0.002
50% of women with uterine atony were administered misoprostol within 25 minutes of determining failure of oxytocin	8/39 (20.5)	28/36 (77.8)	< 0.001
90% of women received prophylactic antibiotics after manual removal of placenta or uterine exploration	11/16 (68.8)	17/18 (94.4)	0.050
100% of women with low haemoglobin (\leq 6g/dl) received blood products	54/55 (98.2)	36/36 (100.0)	0.416
70% of women received blood products within 15 minutes of being diagnosed with a massive PPH	13/52 (25.0)	22/36 (61.1)	0.001
75% of women with a massive PPH were managed surgically within 60 minutes after being diagnosed or within 120 minutes of delivery	2/5 (40.0)	3/3 (100.0)	0.196

Outcome target standards

The performance levels for the outcome criteria at baseline and re-audit are shown in Table 4. None of the standards were achieved at baseline, while one of the two standards were achieved at

re-audit and both significantly improved. There were no maternal deaths amongst the audited files at baseline and re-audit, however one maternal death from PPH was recorded amongst the excluded patients at baseline. This patient was excluded because the file and detailed information was not available, but the death itself remains an important finding.

Table 4: Results for outcome target standards

Outcome target standards	Baseline N=82 n (%)	Re-audit N=70 n (%)	p value
90% of women treated and stabilised from complication of PPH within 6 hours	60 (73.2)	64 (91.4)	0.004
70% of women were given a follow up date within one month of being discharged from hospital	21 (25.6)	43 (61.4)	<0.001

Changes and implementation of changes

The audit team made recommendations to address the poor performance observed in the baseline audit. The implementation of changes engaged all doctors and nurses involved in patient care at the maternity ward. The interventions to improve care of PPH are described in Table 5.

Table 5: Summary of interventions to improve care of PPH

No	Interventions
1	One hour of in-service training was organised on a weekly basis and the topic repeated for three weeks to ensure coverage of all clinical staff. The nurse in charge of maternity ward made sure that all the nursing staff attended. All doctors in the department were also expected to attend.
2	Each nurse in charge of a shift made sure that all blood pressure machines were functioning and reported any problems to the nurse in charge of maternity, who ordered new machines if necessary.
3	Guidelines and standard operating procedures were photocopied and made available for easy access to all staff members involved in patient's management in the labour and postnatal wards
4	Nurse in charge of maternity ward allocated five beds in labour ward for women in the fourth stage of labour. One enrolled nurse was made responsible for the close monitoring of these women and recording of all clinical findings in the patient's file. The nurse in charge double checked if all information was well documented before transfer to the postnatal ward. In the postnatal ward, the nurse in charge triple checked the completeness of information in the maternity record (documented from labour ward) and continued the same observations and instructions.

Improving the quality of care is always challenging and this cannot be achieved without the engagement of all local and international stakeholders with the commitment of healthcare workers. The results of our study show that improving the knowledge and skills of healthcare workers through training (or in-service training) in obstetric emergencies induced a rapid effective response to obstetric haemorrhage and shock, and promote adherence to standard guidelines which improved the quality of care.

Discussion

A number of relatively simple interventions led to significant improvement in the structure, process and outcomes of care for PPH. Structural interventions included the availability of essential equipment, clinical guidelines and the training of staff, while process interventions included the re-organisation of the labour and postnatal wards for women in the fourth stage of labour in order to monitor them closely. As a result, outcomes significantly improved such as the time taken to diagnose PPH and the percentage of women stabilised within 6-hours. Reducing the time it takes to receive skilled care in an adequately resourced healthcare facility has been linked to reduce deaths from obstetric haemorrhage.^{24,26}

Many countries are implementing training programmes to improve healthcare workers knowledge and skills in managing obstetric emergencies. In South Africa for instance the training programmes called the Essential Steps in Managing Obstetric Emergencies (ESMOE) and the Emergency Obstetric Simulation Training (EOST) have shown a statistically significant improvement of the knowledge and skills among trained healthcare workers involved in maternity care as well as renewed enthusiasm, motivation and team work.³² The South African inter-ministerial committees on maternal, perinatal and child mortality in South Africa have also emphasized the need to strengthen the health system to ensure 24-hour access to functioning emergency obstetric care, the provision of dedicated inter-facility transport, the development of maternity homes and standardized referral criteria.³³ At St Francis Hospital, Nsambya in Uganda interventions such as training of healthcare workers involved in maternity, drills and displaying guidelines was also associated with improvements in the quality of care for patients with PPH, severe pre-eclampsia and eclampsia.⁵

Our study agrees with the Ugandan's experience, which showed an improvement in the quality of care for PPH by the implementation of simple interventions. The sustainability of these interventions, however, requires the implementation of well-structured training programmes, equivalent to ESMOE and EOST, and strong leadership of the health system. Improved skills implementation and quality obstetric care should make a positive impact by reducing MMR.

The PPH cases were diagnosed based on the visual estimation of blood loss after delivery. This could have been underestimated and the number of PPH cases might have been higher. In order to minimize selection bias the files of all women diagnosed with PPH during the audited period were selected. The archiving of maternity records was relatively adequate, but 24 files were missing altogether from both audits, 15 at baseline and nine files during the re-audit. It is possible that these additional files could have altered the findings if the data was available.

One maternal death due to PPH complications was noticed in the baseline audit, but the audit team did not have access to the patient's file which had already been sent to the regional offices for evaluation

A quality improvement cycle is a continuous process and requires a commitment of all healthcare workers and the hospital's management committee to be actively involved. The results of this study should be shared amongst the key members implicated in maternity care delivery in our healthcare setting from the individual nurse, doctor, the Department of Obstetrics and Gynaecology, the hospital management committee and the health system. For the provision of sustainable quality obstetric care, the following recommendations are made:

Nurses should apply the principles of active management of the third stage of labour, maintain an active monitoring of women in the fourth stage of labour and regularly attend in-service training.

Doctors should update themselves with the latest guidelines and standard operating procedures relating to obstetric emergencies, and regularly attend Continuing Medical Education (CME). They should be responsible for initiating, sustaining and participating in ongoing quality improvement projects. A further QIC project should focus on the quality of monitoring of women in labour.

The Department of Obstetrics and Gynaecology should motivate for the implementation of well-structured training programmes such as ESMOE and EOST.

The hospital management should budget for ongoing training (ESMOE and EOST) of doctors and nurses dealing with maternity care, for the purchase of sufficient medical equipment and resources, as well as for the maintenance of medical equipment (such as anaesthetics machine, ultrasound and cardio-tocograph). Management should ensure sufficient staffing levels in labour and postnatal wards. Electronic medical records may support more effective clinical governance activities in future.

The government should ensure that there are sufficient posts for doctors and nurses to deal with the workload at labour and postnatal wards and to prevent staff burn-out. They should allocate a budget for healthcare workers capacity building via adequate training programmes (for all hospitals) and for purchasing of necessary medical equipment, supplies and medicines.

Conclusions

In many African countries the poor quality of the emergency obstetric care, including the care of women diagnosed with obstetric haemorrhage, is implicated in the high level of the MMR. The quality of care of women diagnosed with PPH in our healthcare setting was substandard and yet simple interventions were planned and implemented to improve the quality of care for PPH. The re-audit showed a significant improvement in all structural, process and outcome criteria.

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